

# COMPETITIVE POTENTIAL ASSESSMENT (CPA) TEST

For Admission to  
Foundation Excel JEE Program  
(IX moving students)

## 1. PREAMBLE :

- In Engineering Education at IITs, NITs or the top Institutions, the Mantra of success is the ability to think on given situation and apply knowledge to find best possible solution in least possible time.
- Potential to succeed in Engineering Entrance Examinations to these institutions is therefore to assess this ability.
- ICAD's CPA test is precisely aimed at this objective, and it consists of carefully framed Multiple Choice Objective Questions.
- 'Mugged up information', casual approach, poor comprehension etc. will not produce any result.

## 2. DETAILS SYLLABUS :

The syllabus is the contents, students have learned in Physics, Chemistry, and Mathematics up to VIII standard (state board / CBSE), Details of the topics are given in the following table. However the question asked in CPA Test will be of probing nature. They will be based on application of the knowledge.

Syllabus of Physics	
1.	<b>Force &amp; Pressure</b> : Definition of force, types & actions. Pressure-definition & formula, atmospheric pressure. Application –pumps.
2.	<b>Friction</b> : concept & types. Factors affecting friction. Applications.
3.	<b>Stars &amp; Solar System</b> : Properties, Application- Satellite motion
4.	<b>Reflection of light</b> : Laws of reflection. Simple instruments. Sun light, functioning of human eye.
5.	<b>Sources of Energy</b> : Solar cell, atomic energy, fossil fuels.
6.	<b>Combustion &amp; flame</b> : Concept & types. Structure of flame, properties of fuel. Global warming, Acid rain.
7.	<b>Magnetism</b> : Properties & uses of Magnet.
8.	<b>Some natural phenomena</b> : Lightning-causes & safety measures, charging by rubbing, types of charge & their interactions. Transfer of charge.
9.	<b>Chemical effects of electric current</b> : Functions of electro-chemical cell, simple cell, volta cell, dry cell, Ni-Cd cell, button cell. Electroplating.
10.	<b>Magnetic field of electric current</b> : Electro-magnetic induction, applications-electromagnet, electrical door bell.
11.	<b>Electrical circuits</b> : Electrical conductors & insulators.
12.	<b>Sound</b> : Concept, Sources, Properties, Noise & Music.

Syllabus of Chemistry	
1.	<b>Structure of Atom</b> : Daltons atomic theory, Thomson's atomic theory, Rutherford's atomic theory, Proton, Neutron & Electron. Atomic number & Mass number. Isotopes. Formation of ions. Valency.
2.	<b>Chemical Reactions</b> : Concept & types.
3.	<b>Metals &amp; Non-metals</b> : Physical & Chemical properties. Uses of metals & non-metals. Nobel metals. Alloys.
4.	<b>Carbon &amp; Carbon Compounds</b> : Properties of carbon, allotropes of carbon. Physical, chemical properties & uses of Carbon dioxide, methane etc.
5.	<b>Air</b> : components, composition, preparation, properties & uses. Air pollution.
6.	<b>Properties of substance</b> : mixtures & methods of separation.
7.	<b>Synthetic fibers &amp; plastics</b> : Types & characteristics of fibers and plastics.
8.	<b>Coal &amp; Petroleum</b> : Constituents and uses.

<b>Syllabus of Mathematics</b>	
1.	<b>Number System</b> : Divisibility. Decimal system-general and expanded form. Operations on & properties of rational numbers. Irrational & Real numbers. Number Line.
2.	Square & square root. Cube & Cube root.
3.	<b>Indices</b> : meaning & laws.
4.	<b>Identities</b> : expressions & expansions, Identities & factors.
5.	Equation in one variable.
6.	Simple simultaneous linear equations of two variables.
7.	<b>Quadratic equations</b> : factor method.
8.	<b>Polynomial of one variable</b> : Polynomial division & factorization.
9.	<b>Commercial Maths</b> : Compound interest, profit & loss.
10.	<b>Statistics &amp; data handling</b> : mean, frequency distribution, frequency polygon. Bar graphs & Pi chart. Concept of probability.
11.	<b>Geometrical figures</b> : Polygons, concept of symmetry.
12.	<b>Triangle</b> : construction, area, congruency & similarity.
13.	<b>Quadrilaterals</b> : construction & area of quadrilateral & polygon.
14.	<b>Circle</b> : construction & properties of tangent & arc. Area.
15.	<b>Parallel lines</b> : properties & application for segment division.
16.	<b>Mensuration</b> : area & volume of geometrical objects.
17.	Direct & inverse proportion.
18.	Introduction to Cartesian coordinate system & Graphs.

### **3. REFERENCE BOOKS:**

- Standard Text Books of Science (Physics & Chemistry) and Mathematics of classes VIII, IX (State Board and NCERT)
- NTSE Books.
- Olympiad Books.
- Any other book for competitive examination for standard VIII

### **4. GENERAL INSTRUCTIONS REGARDING TEST PAPER :**

- The question paper will consist of objective type questions having multiple choices known as MCQ.
- Each question will have four choices as possible answers, namely (a), (b), (c), and (d).
- There will negative marking (3R-1W), which means that for correct answer, 3 marks will be awarded & 1 mark will be deducted for wrong answer.
- All the answers are to be marked by darkening the appropriate bubble(s) against the corresponding question.
- Darkening must be done carefully and fully by BLACK BALL POINT PEN ONLY.
- There is no provision of canceling the darkened bubble and marking another bubble, such answers will be treated as WRONG answers.
- Sample question paper and corresponding correct bubble sheet is provided for your reference.

### **5. SPECIAL TIPS FOR MAXIMIZING SCORE :**

- Give exactly ONE hour to each subject i.e Physics, Chemistry, and Mathematics.
- Start solving question paper sequentially.
- Read the question very carefully, comprehend it while reading, and jot down important things contained in the question on rough sheet/space (1 minute), think whether you can answer it or not (30 sec), if you can answer it, solve and darken the appropriate bubble(s), only if you are confident about the answer (30 sec).
- If you think that it is beyond your limit to get answer, go to the next question; do not waste your time.
- Accuracy should be the first criteria than Speed.

### **6. SAMPLE QUESTION PAPER :**

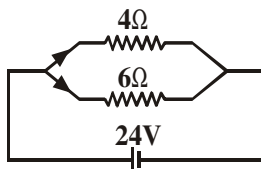
- The format (No. of Questions, Max. Marks & Time) of the actual CPA test paper may be different than the Sample Paper. However, general nature will remain same.

**[ PHYSICS ]**

**CHOOSE THE CORRECT OPTION :**

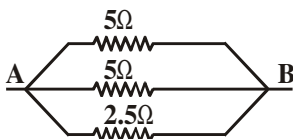
01. An object 4cm in height is placed at distance of 36 cm. from a concave mirror of focal length 12cm. Where will the image be formed ?  
 (a) 8 cm to the left of mirror (b) 12 cm to the left of mirror  
 (c) 18 cm to the left of mirror (d) 20 cm to the left of mirror
02. It is easier to draw up wooden block along an inclined plane than hang it up vertically principally because  
 (a) The friction is reduced (b) Only a part of the weight has to be overcome (c) The mass becomes smaller  
 (d) g becomes smaller
03. A piece of ice is floating in a vessel containing water and inside the ice, there are few lead shots. When the ice melts completely, the level of water will  
 (a) Go down (b) First go down and then go up  
 (c) Remain the same (d) Go up
04. Two bodies A and B are floating on water in such a way that  $\frac{9}{10}$  volume of A and  $\frac{2}{3}$  volume of B is submerged under water. The ratio of the densities of A and B is  
 (a) 3 : 5 (b) 5 : 3 (c) 20 : 27 (d) 27 : 20
05. In a child's toy, gears are connected, as shown. The larger gear has 15 teeth and makes 12 revolutions per minute. The smaller gear has 9 teeth. The time in seconds for the smaller gear to make 1(one) revolution is  
 (a) 2 (b) 5 (c) (d) None of these
06. Magnetic keepers are made of:  
 (a) horse shoe magnet (b) steel (c) soft iron (d) nickel
07. One mega joule approximately equals  
 (a) 240 kcal (b) 2400 kcal  
 (c) 24 kcal (d) 2.4 kcal
08. Sound can travel through  
 (a) solids alone (b) liquids alone  
 (c) gases alone (d) solids, liquids and gases

09. The current flowing in  $6\Omega$  resistor in the circuit given below is



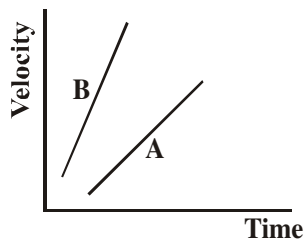
- (a) 4A (b) 6A (c) 2A (d) 5A

10. The equivalent resistance between AB in the circuit is



- (a)  $\frac{3}{5}\Omega$  (b)  $\frac{5}{3}\Omega$  (c)  $\frac{5}{4}\Omega$  (d)  $\frac{4}{5}\Omega$

11. Figure shows the velocity-time graphs for two objects, A and B, moving along the same direction. Which object has greater acceleration ?



- (a) A (b) B  
(c) both have same acceleration (d) None of these
12. The time in a watch is 1 : 40 the find time shown by its mirror image.  
(a) 9 : 20 (b) 10 : 20 (c) 11 : 20 (d) 1 : 40
13. If a mirror move towards a stationary person with velocity 4 m/s. then the speed of image person with respect to him is  
(a) 8 m/s (b) 4 m/s (c) 10 m/s (d) 2 m/s
14. The nature of image used in automobiles to see rear field view 6]  
(a) erect and real (b) virtual & bigger (c) virtual and erect (d) Inverted & smaller
15. Two resistance connected in series and then parallel. Thire equivalent resistance are 5 and 6/5 respectively then two resistances are  
(a) 2, 4 (b) 1, 4 (c) 2, 3 (d) 5/2, 5/2



## [ CHEMISTRY ]

### CHOOSE THE CORRECT OPTION :

16. The number of protons and neutrons present in the nucleus of Argon atom with atomic number 18 and atomic weight 40 respectively are  
(a) 22 and 18 (b) 18 and 22  
(c) 20 and 18 (d) 18 and 24
17. Which among the following is a metalloid.  
(a) carbon (b) selenium (c) zinc (d) aluminium
18. The maximum capacity of N shell is  
(a) 2 (b) 8 (c) 18 (d) 32
19. In Exothermic and Endothermic reaction  
(a) Heat is absorbed and heat is evolved respectively  
(b) Heat is evolved and heat is absorbed respectively  
(c) Heat is absorbed in both the cases  
(d) Heat is evolved in both the cases
20. Element with complete octet is  
(a) He (b) Na (c) Ar (d) F
21. Which among the following gas is used for welding work.  
(a) Methane (b) Ethane (c) butane (d) Acetylene
22. The  $C \equiv C$  is present in  
(a) Methane (b) Ethylene (c) Acetylene (d) Ethane
23. Element forming mono positive ion for complete octet is  
(a) Cl (b) F (c) K (d) Al
24. The M shell is the valence shell in  
(a) Cl (b) He (c) C (d) Ne
25. Which among the following gas is present in biogas.  
(a)  $C_2H_4$  (b)  $CH_4$  (c)  $C_2H_2$  (d)  $C_3H_6$
26. Which among the following is a compound radical  
(a)  $H^+$  (b)  $Cl^-$  (c)  $Al^{+3}$  (d)  $NH_4^+$

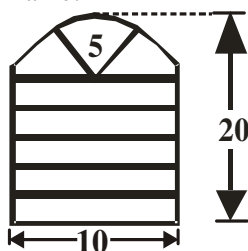
27. Which among the following is a physical change  
 (a) Rusting of iron (b) water converted to steam  
 (c) copper sulphate dissolved in water (d) burning of magnesium metal
28. In 56 gms of calcium oxide, the mass proportion of calcium and oxygen is 40 and 16 respectively. Hence, one molecule of calcium oxide should contain  
 (a) 1 atm of oxygen and 4 atoms of calcium (b) 4 atom of oxygen and 1 atm of calcium  
 (c) 1 atom of calcium and 1 atom of oxygen (d) none of these
29. In a dry cell, the positive pole is  
 (a) carbon rod (b) zinc case (c) ammonium chloride (d) brass cap.
30. The only sources of energy that is independent of the sun is  
 (a) atomic energy (b) mechanical energy (c) electrical energy (d) b and c together



## [ MATHEMATICS ]

CHOOSE THE CORRECT OPTION:

31.  $\frac{P^{7/2} \sqrt{n^3}}{P^{5/2} \sqrt{n}} = ?$   
 (a)  $\frac{P^2}{n}$  (b)  $\frac{P^3}{n^2}$  (c)  $\frac{P^6}{n^3}$  (d)  $pn$
32. The sum of the angles of a regular polygon is greater than the sum of exterior angle of that polygon by  $3600^\circ$ . Find the number of sides of that polygon.  
 (a) 24 (b) 22 (c) 18 (d) 20
33. A sum of money at compound interest amounts to Rs. 5290 in 2 years and to Rs. 6083.50 in 3 years. Find the rate of interest  
 (a) 15%, pa (b) 18% , pa (c) 12%, pa (d) 20%, pa
34. Choose the correct identity from the following  
 (a)  $(a+b+c) = \frac{a^2+b^2+c^2}{a-b+c}$  (b)  $\left(a + \frac{1}{a}\right)^2 = a^2 + 2a + \frac{1}{a^2}$   
 (c)  $a^3 + b^3 + c^3 = 3abc$  (d)  $(k^2 + k + 1)(k^2 - k + 1) = k^4 + k^2 + 1$
35. My married neighbour has reached an age of that is a square of some number. The product of the digits of his age is his wife's age. The age of their daughter is the sum of the digits of the mother's age. How old is my neighbour?  
 (a) 81 (b) 94 (c) 49 (d) 36
36. What is the perimeters of the window frame.



- (a)  $25\pi + 60$  (b)  $10\pi + 60$  (c)  $10\pi + 50$  (d)  $5\pi + 40$
37. If  $\frac{a+b}{\sqrt{a} + \sqrt{b}} = x$  then  
 (a)  $x = \sqrt{a+b}$  (b)  $x = \sqrt{a} + \sqrt{b}$  (c)  $x = \sqrt{a} - \sqrt{b}$  (d) none of these
38. If  $x - \frac{1}{x} = 4$ , then  $\frac{1}{x} + 6x^2 + \frac{6}{x^2} - x$  is  
 (a) 108 (b) 104  
 (c) 15 (d) can not be found out
39. There is a footpath of uniform width of 1m all about a rectangular swimming pool. The length of the pool is  $\frac{3}{2}$  times its breadth. The area of the foot path is 204 square metre. Find the length and the breadth of the pool.  
 (a) 30m, 45m (b) 20m, 30m (c) 40m, 60m (d) 34m, 51m

40. The total surface area of solid hemisphere is

- (a)  $2\pi r^2$                       (b)  $3\pi r^2$                       (c)  $4\pi r^2$                       (d)  $\frac{2}{3}\pi r^2$

41.  $\frac{1}{\sqrt{9}-\sqrt{8}} - \frac{1}{\sqrt{8}-\sqrt{7}} + \frac{1}{\sqrt{7}-\sqrt{6}} - \frac{1}{\sqrt{6}-\sqrt{5}} + \frac{1}{\sqrt{5}-\sqrt{4}}$  is equal to

- (a) 0                                      (b)                                      (c) 1                                      (d) 5

42. If  $x = 3 + 2\sqrt{2}$  the value of  $\left(\sqrt{x} - \frac{1}{\sqrt{x}}\right)$  is

- (a) 1                                      (b) 2                                      (c)  $2\sqrt{2}$                                       (d)  $3\sqrt{3}$

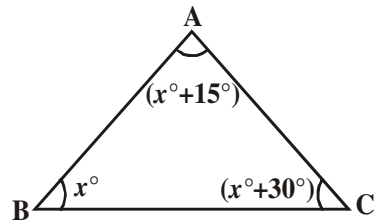
43. The number which exceeds 16% of itself by 42 is

- (a) 50                                      (b) 52                                      (c) 58                                      (d) 60

44.  $x$  is 90% of  $y$ . What % of  $x$  is  $y$

- (a) 90%                                      (b)  $101\frac{1}{9}\%$                                       (c)  $111\frac{1}{9}\%$                                       (d) 190%

45. In figure,



the greater side is

- (a) AB                                      (b) BC                                      (c) CA                                      (d) AB = BC



**Answer Key :**

ROLL NUMBER		Q.No.	Q.No.	Q.No.	Q.No.
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0	0	6	56	106	156
1	1	7	57	107	157
2	2	8	58	108	158
3	3	9	59	109	159
4	4	10	60	110	160
5	5	11	61	111	161
6	6	12	62	112	162
7	7	13	63	113	163
8	8	14	64	114	164
9	9	15	65	115	165
NAME : <u>Solution copy</u>		16	66	116	166
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